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Original Research Article

Effects of *Maerua pseudopetalosa* (Gilg and Bened.) De Wolf tuber extracts on haematological parameters of Wistar rats

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Abstract: The effect of ethanol and ethyl acetate extracts of *Maerua psuedopetalosa* administered at 50, 250 and 500 mg/kg body weigh doses for a week was investigated on heamatological parameters in Wistar rats. Rats dosed with the ethyl acetate extract showed significant decrease in the values of RBC counts, HCT and LY at a concentration of 50 mg/kg, whereas MCHC exhibited increase at a concentration of 50 and 250 mg/kg and increase in GR counts at a concentration of 50mg/kg. On the other hand ethanolic extract had shown no significant effect on most hematological parameters except PLT and lymphocyte counts which were exhibited significant decrease in rats receiving 250 and 50 mg/ kg BW respectively ($p < 0.05$). Mortality occurred in the 500 mg/ kg dose group.
Keywords: *Maerua psuedopetalosa* , heamatological parameters, Wistar rats and Mortality.

INTRODUCTION

Medicinal plants typically contain several different pharmacological active compounds that may act individually, additively or synergistically to improve health [1]. Plants produce bioactive compounds which act as defense mechanisms against predators and at the same time, may be toxic in nature [2, 3]. With the upsurge of interests in medicinal plants, there is need for thorough scientific investigations on their efficacy and potential toxicity [4]. The administration of herbal preparations without any standard dosage coupled with non- availability of adequate scientific studies on their safety has raised concerns on their toxicity [5]. The various haematological parameters investigated in this study are useful indices that can be employed to assess the toxic potentials of plant extracts in living systems [6]. Such toxicity testing is relevant to risk evaluation as changes in the haematological system have higher predictive value for human toxicity, when data are translated from animal studies [7].

Recently, concerns had been raised over the lack of quality control and scientific evidences for the efficacy and safety of medicinal plants [8, 9]. Therefore screening plants for toxicity, and ascertaining their safety is a vital ethical issue.

The plant *M. pseudopetalosa* (family Cappariaceae) is known as Kordale in Sudan, the fruits are eaten as a famine food after careful preparations to remove the toxic substances. The roots are traditionally used as cough remedy and cure for tumors. The toxic principle known as tetramethyl ammonium iodide (tetramine) is reported to be present in the tuberous root, root and leaf of the plant [10] . Although this plant is of a wide spread use in tropical Africa, yet there is little available literature on the scientific evaluation of its toxicological effects. This work therefore, investigates the effects of tuber extracts on heamatological parameters of Wistar rats.

MATERIALS AND METHODS

Plant material

The plant under investigation (*M. pseudopetalosa*) was collected from Upper Nile (Aaly Al Neel), Republic of South Sudan .The plant was authenticated at the Department of Botany by Prof. Hatil Alkamali, Omdurman Islamic University, Sudan.

Preparation of crude plant extracts

The tuberous roots were air dried, ground into a coarse powder form and soaked for 3 days in each of ethyl acetate and ethanol consecutively. The plant material was then shaken overnight on a shaker, then filtered, evaporated to dryness under reduced pressure in a rotatory evaporator and weighed.

Experimental animals and dosing

Forty eight male Wistar rats weighing 150 grams were obtained from the Medicinal and Aromatic Plants Research Institute (MAPRI), Khartoum. The rats were divided into eight equal groups (G1 – G8). Each group was kept in a plastic cage, freshly spread with saw wood to absorb urine and housed under standard conditions of temperature, and humidity with alternating 12 hours light/dark cycles. Commercial standard diet and water was supplied *ad libitum* throughout the experimental period (one week).

Group 1, 2, and 3 rats were orally dosed with 50, 250 and 500 mg/ kg body weight (BW) ethyl acetate plant extract, respectively, while rats of groups 5, 6 and 7 were dosed similarly but with the ethanolic plant extract. Rats of groups 4 and 8 were orally dosed with distilled water and acted controls for the ethyl acetate and ethanolic extracts groups, respectively. Application of the extract doses was administered by the use of a special stomach tube with a smooth tip to protect the interior lining of the oral and buccal cavity of the animal from injury.

Blood sampling and processing

At the end of the experiment the rats were decapitated and two blood samples were obtained from each rat. One sample was collected in a tube containing potassium ethylene di-amine tetra acetate (anticoagulant) for hematological analysis and and kept in a refrigerator for analysis.

Statistical analysis

The collected data were analyzed and expressed as means ± standard deviation SD of six replicates and were subjected to one way analysis of variance (ANOVA) followed by Duncan multiple range test to determine significant differences in all the parameters. Values were considered statistically significant at $p < 0.05$ [11].

RESULTS AND DISCUSSION

There is lack of information about possible toxic effects of *M. pseudopetalosa.* The only available toxicity study was reported by Henery [10] in rabbits and mice given aqueous extracts of the plant tubers *per os*. Purification of the aqueous extracts gave crystals of iodide salts (tetra methyl ammonium salts), which was lethal within two minutes when injected into rabbits in concentrations of 2 and 8 mg/kg body weight. The present study may be considered as pioneer investigation on the effect of the plant tuber extracts, administered to rats, on the hematological parameters.

Assessment of hematological parameters can be used to determine the extent of deleterious effect of foreign compounds, including plant extracts, on the blood constituents of an animal [12, 14]. It can be used to explain blood relating functions of chemical compound or plant extract [14]. The administration of ethyl acetate extract of *M. psuedopetalosa* tubers had significant effects on some hematological parameters; significant decrease was observed in RBC and HCT values at the 50 mg/ kg dose. The highest values for MCH, MCHC, GR and MO were obtained for rats receiving the 50 mg/kg dose and these were significantly higher ($P<0.05$) than values of control or rats dosed with 500mg/kg ethyl acetate extract. In addition, the MCHC and MO values were also significantly higher than those of rats given the 250 mg/kg dose (Table 1). Similar results to those obtained for the ethyl acetate extract were obtained by Chinenye *et al.* [15] who reported significant increases in GR percentage in female albino rats given aqueous extract of *Ficus platyphylla*. Insignificant increase in GR was also recorded by Orleans *et al.* [16] in rats given aqueous herbal extract.

On the other hand ethanolic extract had shown no significant effect on most hematological parameters except PLT count which exhibited significant decrease($P<0.05$) (Table 2). MCHC was significantly increased in the treated groups compared to control. Reduction in platelets count in experimental animals has been reported to indicate adverse effect on the oxygen-carrying capacity of the blood [17, 18]. However, Attawish *et al*.,[19] Chavalittumrong *et al.* [20] and Orleans *et al.* [16] found no significant differences in the blood parameters they tested in Wistar rats given aqueous herbal extracts in different concentrations.

Lymphocytes are the main effective cells of the immune system [14]. The present results indicate no significant difference in LY counts in the treated rat groups compared to control, except for rats receiving the 50 mg/kg dose of ethyl acetate or ethanol extracts; these showed a significant decrease in LY counts. Monocytes are known to increase in case of infection. This increase may possibly lead to stimulation of the immune system, as reported by Ashafa and Olunu [21].

Similar results to those obtained in this investigation for PDW and RDW ethanol extract rat groups were obtained by Chavalittumrong, *et al.* [20] and Orleans *et al.* [16] who detected no significant differences in the two parameters in rats administered with aqueous herbal extracts.

It was reported that treatment of Wistar rats with concentrations of 100, 200, 30 and 400 mg/kg aqueous extracts of *Anispus mannii* caused no significant differences in HB and WBC values, compared to the control, even when the treatment period was extended to 28 days, while effective significant increase in RBC values were observed in 14 days [22]. The no significant effect of the ethanolic extract on RBC could mean that the balance between the rate of production and destruction of blood corpuscles was not affected. MCH, MCHC and MCV

relates to individual red blood cells while Hb, RBC and PCV are associated with the total population of red blood cells. Therefore, the absence of observable significant effect of the extracts on any one of these parameters may be an indication that neither the incorporation of haemoglobin into the red blood cells nor the morphology and osmotic fragility of the red blood cells was altered [23].

In general, the hematological results obtained for the rat groups treated with the ethyl acetate or ethanol extract are not consistent to draw sound conclusion.

Table 1: Hematological parameters of Wistar rats orally dosed with different concentrations of *M. pseudopetalosa* ethyl acetate tuber extract

Parameter	Control	50 mg/kg	250mg/kg	500mg/kg
WBC10^9/L	6.54^{a}±1.1	5.14^{a}±1.2	5.29^{a}±1.1	6.19^{a}±1.2
RBC10^{12}/L	9.80^{a}±1.0	7.06^{b}±1.5	8.84^{a}±0.5	8.78^{a}±0.5
HGB g/dL	141.17^{a}±10	110.17^{b}±3.9	132.67^{ab}	129.67^{ab}±3.7
MCV fl/red cell	61.67^{a}±5	60.67^{a}±4.6	61.33^{a}±2.1	62.17^{a}±5.5
MCH pg/red cell	14.38^{b}±1.0	15.57^{a}±0.8	15.10^{ab}±0.9	14.68^{b}±1.0
MCHC g/dL	233.5^{c}±7	256.17^{a}±2	245.67^{b}±6	236.17^{c}±3
HCT %	$61. 78^{a}$±8.6	42.95^{b}±4.6	53.95^{a}±2.3	54.80^{a}±2.4
MPV fl/plate let	7.68^{a}±1.03	7.28^{a}±1.02	7.50^{a}±1.01	7.58^{a}±1.0
PLT 10^9/L	910.33^{a}±5.2	666.2^{a}±31	887.8^{a}±32	837^{a}±30
RDW	15.62^{a}±1.1	16.03^{a}±0.9	16.38^{a}±2.1	16.22^{a}±1.2
PDW	32.60^{a}±2.3	31.77^{a}±1.8	32.38^{a}±1.0	31.73^{a}±0.9
LY	24.82^{a}±6.1	60.13^{b}±5.8	72.38^{a}±7.1	74.90^{a}±6.5
GR	20.63^{b}±2.3	30.75^{a}±9.2	23.70^{ab}±3.01	19.00^{b}±2.1
MO	5.08^{b}±1.0	8.97^{a}±2.1	3.97^{b}±0.5	3.13^{b}±1.0
GRA	1.24^{a}±0.01	1.84^{a}±0.02	1.53^{a}±.003	1.28^{a}±.001
LYM	4.92^{a}±0.9	3.26^{a}±0.8	4.36^{a}±0.7	4.96^{a}±0.6

Means with the same superscript across the row for each parameter are not significantly different ($p<0.05$)

Table 2: Hematological parameters of Wistar rats orally dosed with different concentrations of *M. pseudopetalosa* tuber ethanolic extracts

Parameter	Control	50 mg/kg	250mg/kg	500mg/kg
WBC10^9/L	6.56^{a}±1.70	8.05^{a}±2.02	6.86^{a}±1.06	-
RBC10^{12}/L	9.80^{a}±2.1	7.87^{a}±1.0	9.42^{a}±2.3	-
HGB g/dL	141.17^{a}±20.2	124.83^{a}	139.33^{a}±15.8	-
MCV fl/red cell	61.68^{ab}±2.4	63.33^{a}±3.0	59.67^{b}±1.2	-
MCH pg/red cell	16.05^{a}±1.01	15.197^{a}±1.2	14.90^{a}±1.0	-
MCHC g/dL	233.50^{b}±30.4	251.67^{a}±15.0	249.33^{a}±14.2	-
HCT %	60.45^{a}±8.5	49.58^{a}±7.9	56.38^{a}±9.7	-
MPV fl/plate let	7.68^{a}±1.0	7.78^{a}±1.0	7.32^{a}±0.1	-
PLT 10^9/L	910.33^{a}±53	773.33^{ab}±40	705.83^{b}±50	-
RDW	15.55^{a}±1.4	16.23^{a}±1.5	16.03^{a}±1.6	-
PDW	32.60^{a}±3.2	32.68^{a}±2.3	32.68^{a}±2.4	-
LY	77.28^{a}±9.4	65.43^{b}±6.0	70.63^{ab}±8.2	-
GR	20.63^{a}±2.3	30.75^{a}±4.02	24.83^{a}±2.4	-
MO	5.08^{a}±0.1	3.83^{a}±0.2	4.52^{a}±0.1	-
GRA	4.91^{a}±1.0	5.22^{a}±0.1	4.82^{a}±0.1	-
LYM	1.307^{a}±.00	2.518^{a}±.002	1.747^{a}±.00	-

Means with the same superscript across the row for each parameter are not significantly different ($p<0.05$). -not detected (died)

CONCLUSION

Changes in the hematological picture of rats receiving either extracts of *M. pseudopetalosa* were not significant to indicate obvious toxic effects of the plant extracts. Further studies using different dose levels of both extracts and large animal groups may be needed to obtain reliable information on the toxicity of *M. pseudopetalosa.*

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